

LEADER IN DEPENDABILITY SINCE 1910

INSTRUCTION MANUAL

for

MODEL 800A

**DYNAMIC MUTUAL CONDUCTANCE
TUBE TESTER**

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NEW YORK

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MODEL 800A

**DYNAMIC MUTUAL CONDUCTANCE
TUBE TESTER**

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10514 DUPONT AVENUE • CLEVELAND 8, OHIO

PHONE — 541-8060
TWX — CV 662

CABLE — HICKOK, CLEVELAND
WESTERN UNION — KJ
2490-477

FUSE PROTECTION

The primary of the power transformer is protected with an 81 lamp. This lamp acts as an overload indicator as it will glow when heavy current is drawn from the transformer; this lamp will glow slightly when testing certain tubes that draw high filament and plate current. However, if the 81 lamp flares up brightly stop the test at once and re-check the roll chart settings and remake the leakage test.

The Bias fuse protects the bias potentiometer. It is a 49 lamp and if it glows even slightly, recheck the settings and remake the leakage test.

STANDARD EIA GUARANTEE

The Hickok Electrical Instrument Company warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair such instruments which, under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any instrument or test equipment which proves to be defective, when returned to us transportation prepaid, within 90 days from the date of original purchase, and provided the serial number has been made known to us promptly for our records.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment, to injure their stability or reliability, or which have been subject to misuse, negligence, or accident, or which have had the serial number altered, effaced or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories, including all vacuum tubes not of our manufacture, used with this product are not covered by this warranty.

This warranty is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

Parts will be made available for a minimum period of five years after the manufacture of this equipment has been discontinued. Parts include all materials, charts, instructions, diagrams, accessories, etc., which have been furnished in the standard model.

RETURNING EQUIPMENT FOR REPAIR

Before returning any equipment for service, under warranty or otherwise, the factory must first be contacted giving the nature of the trouble. Instructions will then be given for either correcting the trouble or returning the equipment. Upon authorization, this equipment should be forwarded directly to the Hickok factory address, 10636 Leuer Avenue, Cleveland, Ohio, or to a designated service station in your locality. All correspondence pertaining to repairs should be directed to the Hickok office address, 10514 Dupont Avenue, Cleveland 8, Ohio, or to the authorized service station designated.

REGISTRATION CARD

The above guarantee is contingent upon the attached registration card being returned to the factory immediately upon receipt of the equipment.

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
Cleveland, Ohio

NOTE

See instructions for filament continuity on page 5, paragraph 15.

To test ACORN TUBES type numbers 6F4, 6L4, 954, 955, 956, 957, 958, 959, 5731, 9004, and 9005 on the Model 800A Tube Tester requires the use of adapter, code number 1050-9.

This adapter will be supplied on special order.

An adapter for subminiature tubes is available on special order.

AUTOMOBILE RADIO TUBES

It often happens that automobiles operated at night with radio, light, fans, etc., all turned on at the same time, put such a severe load on the auto battery that the battery is unable to deliver full voltage especially in slow moving traffic or when waiting for traffic light. If auto radio trouble is experienced much time can be saved by first checking the tubes at 6.3 volts, then switching the filament voltage to 5 volts. If tube reading drops markedly at 5 volts the tube should be replaced.

If the automobile has 12 volt radio system, first check the tubes at 12.6 volts, then drop to 10 volts for recheck.

ADDENDA SHEET
FOR MODIFICATION OF
TUBE TESTER MODEL 800 A
(from 115 Volts to 230 Volts Operation)

The Model 800A Tube Tester is designed to operate on either 115 volts or 230 volts. It is shipped from the factory to operate on 115 volts. If 230 volt operation is desired, it is necessary to change the wiring of the power transformer from a parallel hook-up to a series hook-up. For 115 volt operation, no modification is necessary. For parallel and series hook-ups, see the schematic wiring diagram in the rear of this manual.

For modification of the Model 800A, from 115 volts to 230 volts, proceed as follows:

1. POWER TRANSFORMER

- a. Disconnect the black wire which is connected to the lug marked (W) and disconnect the white-black wire which is connected to the lug marked (X).
- b. Splice together and solder the two above wires. Insulate connection with electrical insulating tape.
- c. Do not disturb other wires which are connected to the lugs marked (W) and (X).

2. LINE FUSE

- a. Replace the No. 81 fuse lamp with a No. 63 lamp.

3. CALIBRATION

Plug Tube Tester into a 230 volt power source and turn on. Depress pushbutton P7 and rotate LINE ADJUST until the meter reads 230 volts. No further calibration is necessary.

4. For modification of the Model 800A from 230 volts to 115 volts, reverse the above procedure.

OPERATING INSTRUCTIONS
FOR
DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER
MODEL 800A

Instructions for operation of Model 800A.

Read these instructions through before attempting to operate the Tester.

1. This instrument is designed to operate on 50 to 60 cycles, 115/230 volt power source.
2. There are two rectifier tubes, an 83 and a 5Y3GT, necessary to operate this tester. They are included. The line fuse lamp for 115V operation is a standard #81 lamp. The line fuse lamp for 230V operation is a standard #63 lamp.
3. Line Voltage Adjustment:

Turn the power on by rotating the LINE ADJUST knob clockwise from its OFF position. Holding down button P7 will cause the meter pointer to move up scale. The button is held down while the LINE ADJUST knob is turned until the meter pointer rests exactly over the LINE TEST mark at the center of meter scale. This establishes standard voltages on the tube. Make final line adjustment after the tube being tested is placed in its socket.

4. SELECTORS - The row of selector knobs across the center of the control panel is for the purpose of conducting proper voltages to the tube's base pins. The operation of setting these selector knobs is similar to dialing a telephone number. On the roll chart, below the word SELECTORS appear the dialing numbers. These dialing numbers consist of two letters and five figures. Example: JR-6237-5. Starting at the left, the first knob (FIL) is turned until it points to the letter J, the second knob (FIL) is turned to R, the third knob (GRID) to 6, the fourth (PLATE) to 2, the fifth (SCREEN) to 3, the sixth (CATHODE) to 7, and the seventh (SUPPRESSOR) to 5.

The selector system is designed to minimize selector settings. For example, the filament setting is nearly always JR. These two knobs seldom need resetting. Also in testing duo-diode-triode tubes the amount of selector setting has been reduced to a minimum.

5. **LEAKAGE OR SHORTS** - Before making a quality check on a tube under test a **LEAKAGE CHECK** must be made. This is accomplished by rotating the leakage switch, located in the lower right hand corner of the panel, from **TUBE TEST** through its five positions and back to **TUBE TEST** position, while tapping the tube and watching the meter for leakage indications. The meter will indicate leakage in ohms up to 10 megohms on the leakage scale which is just below the **REPLACE-GOOD SCALE**.

Note

When making a **SHORT** test, be sure that the **SELECTOR** switches are not in the same position. If two or more switches are in the same position, a false short will result.

An asterisk * near the 200,000 ohm mark on the leakage scale, indicates the approximate value where a lamp in a conventional neon lamp short test would glow. Tubes showing leakage to the right of this mark should be discarded without further test, unless specified otherwise, in notations column. By using the meter to indicate leakage a more accurate check is provided. This is helpful in selecting tubes, especially those with high heater to cathode leakage (Position No. 1) for special applications.

With tubes having more than one section such as the 12AV6, make a leakage check for each section.

LOCATING LEAKAGE BETWEEN ELEMENTS. In the following table (X) under any leakage switch position, indicates leakage between elements shown.

Kind of Short	1	2	3	4	5
Htr-Cath	X				
Htr-Grid		X			
Htr-Scrn		X	X		
Htr-Plt		X	X	X	
Htr-Sup		X	X	X	X
Cath-Grid	X	X			
Cath-Scrn	X	X	X		
Cath-Plt	X	X	X	X	
Grid-Scrn			X		
Grid-Plt			X	X	
Grid-Sup			X	X	X
Scrn-Plt				X	
Scrn-Sup				X	X

6. **MUTUAL CONDUCTANCE** - If the tube passes the preliminary leakage test it is then tested for **MUTUAL CONDUCTANCE** which is the best test for amplifier tubes. Turn the leakage switch to **TUBE TEST** position. On the roller chart, reading from left to right, opposite the tube type appear: **FIL.VOLTAGE**; **SELECTORS**, which were explained in paragraph (4) above; **BIAS**, which gives the setting for the **BIAS** dial; **SHUNT**, which gives the setting for the **SHUNT** dial; **PRESS**, which indicates the push button to be pressed for meter reading; **MUT-**

COND. which gives the AVERAGE MUTUAL CONDUCTANCE in MICROMHOS of the tube being tested. Under the heading NOTATIONS appear special notes pertaining to the testing of the tube. The SHUNT setting is used when it is desired to read the value of the tube on the RED-GREEN (GOOD & REPLACE) sector of the meter scale. When using the SHUNT scale the MICROMHO readings are disregarded.

NOTE

Tubes having less than 500 Micromhos cannot be made to read in the GREEN sector of the meter scale. Such tubes list micromho reading only and are good if the reading is above a specified minimum.

Micromhos are indicated in three ranges 0-3000, 0-6000, 0-15,000.

- a. On the SHUNT dial are three dots stamped into the metal and filled with red lacquer. These dots are the points used in setting the micromho ranges.
- b. The dot near 73 on the dial is the setting point for the 3000 micromho scale.
- c. The dot near 86 is the point for the 6000 micromho scale.
- d. The dot near 92 is the point for the 15,000 micromho scale.
- e. When reading micromhos the RED and GREEN sectors of the meter scale are disregarded.
- f. When testing for mutual conductance the push switch P4--Gm is pressed. Gm is the symbol for mutual conductance.

CAUTION: Do not press P4 when testing rectifier tubes.

- g. Tubes having more than one section, such as the 6J6, require different dial settings for each section.

7. RECTIFIER TUBE TEST - Rectifier tubes, including diode tubes and diode sections of multiple element tubes, having no mutual conductance are tested for emission only.

- a. The push switch P1 is used when testing detector diodes. It applies a low voltage which will not injure the delicate cathode. Good diodes will cause the pointer of the meter to move above the point marked DIODES OK.
- b. The push switch P2 is used when testing cold cathode rectifiers such as the OZ4. This applies a voltage sufficiently high to ionize the tube and start conduction. Good tubes will read in the green (GOOD) sector of the meter scale.

c. The push switch P3 is used when testing ordinary rectifier tubes, such as the 5Y3. This applies a medium voltage which is best adapted to reveal defects in this type of tube. Good tubes will read in the green (GOOD) sector of the meter scale.

NOTE

On the data chart a star (*) following P1, P2, P3, and P5 indicates that the SHUNT setting only is used.

8. GAS TEST - The push switches P5 and P6 are used to test an amplifier tube for gas content.

a. Set the SHUNT dial at 73.

b. The push switch P5 is pressed and held down while the BIAS dial is turned to cause the pointer of the meter to indicate 100 micromhos on the 0-3000 scale.

c. Hold down P5 and press P6.

d. If the tube contains gas the pointer of the meter will move UP the scale. If the pointer movement is not more than one division of the scale the gas content is satisfactory.

NOTE

With some tubes, such as the type 45, the micro-mhos reading cannot be brought down to 100 by turning the BIAS dial. In such case turn the BIAS dial to 100 and test for gas.

e. Some tubes develop gas after being heated for a period of time. If a tube is suspected, allow it to heat for a few minutes.

9. METER REVERSE - With certain tubes, such as the 117N7, the meter will deflect backwards (to the left) when push switch P3 is pressed for rectifier test. In such a case push P6 also. This will cause the pointer of the meter to move up the scale.

10. TOP CAPS - There are two jacks in the upper center of the control panel marked GRID and PLATE. These are used when making connection to the top cap of the tube being tested. On the data chart in the NOTATIONS column opposite tube types having top caps is the notation CAP=G or CAP=P. G means that the top cap is connected to GRID jack and P that it is connected to the PLATE jack.

11. SOCKET NUMBERING - In order to reduce selector set-up to a minimum, the socket contacts are numbered as shown on Plate 1 which shows the bottom

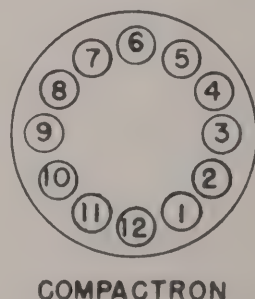
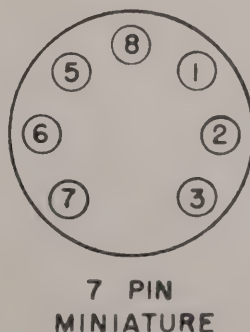
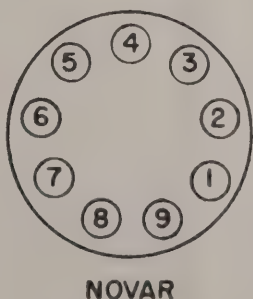
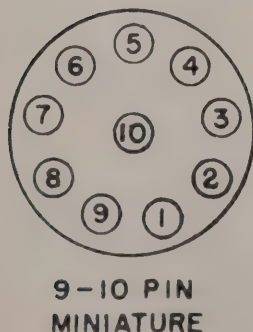
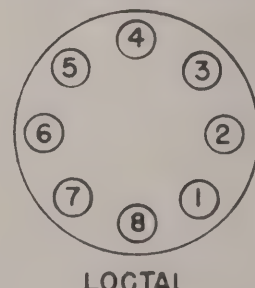
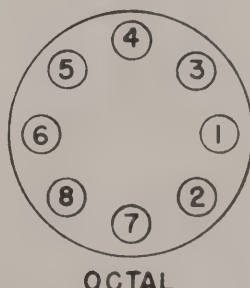
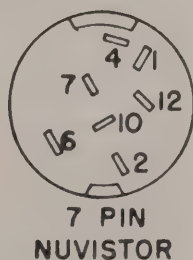
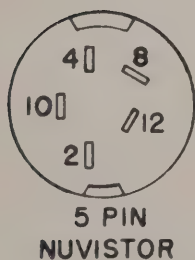
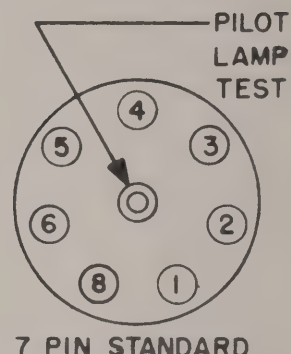
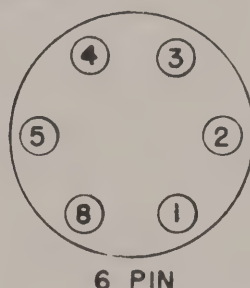
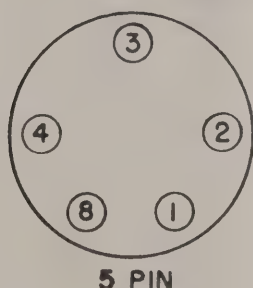
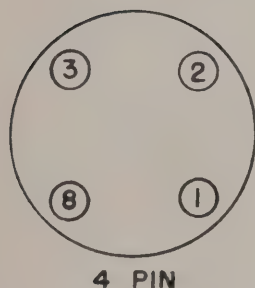
views. The numerical values of the lettered switch positions are as follows:

SOCKET CONTACTS	FIL.	FIL.	GRID	PLATE	SCRN.	CATH.	SUPP.
O	A	P	O	O	O	O	O
1	B	R	1	1	1	1	1
2	C	S	2	2	2	2	2
3	D	T	3	3	3	3	3
4	E	U	4	4	4	4	4
5	F	V	5	5	5	5	5
6	G	W	6	6	6	6	6
7	H	X	7	7	7	7	7
8	J	Y	8	8	8	8	8
9	K	Z	9	9	9	9	9
10	1	1	A	A	A	A	A
11	2	2	B	B	B	B	B
12	3	3	C	C	C	C	C
13	4	4	D	D	D	D	D

The letter I was omitted because of its resemblance to the number 1. The letter Q was omitted because of its resemblance to the letter O.

SOCKET NUMBERING

BOTTOM VIEWS



NOTE

The center of the large 7-pin socket is used to check pilot lamps. Set the filament selector switches on JR. Set the filament voltage switch to the proper voltage for the lamp being tested.

12. SPECIAL NOTES - Power line voltage varies with different localities. It may also vary with different hours of the day.

While a national survey indicates that the average voltage for the USA is about 117 volts, it does not mean that every locality maintains a constant voltage at that level.

Occasionally we have had the complaint that a used tube will test GOOD, but will not work in the radio receiver; but when a NEW tube is substituted, the receiver will operate correctly. The answer is this: Tubes are built to specifications. Our tube testers are designed to test tubes in conformity with these specifications.

The used tube that would not perform in a certain receiver was not receiving its specified filament voltage. The new tube performed because of its initial reserve capacity. The used tube would have performed if it had received its specified filament voltage.

Tube failure frequently occurs in A. C.--D. C. sets where several tubes are connected with their heaters or filaments in series. Sometimes, even though the power line voltage is normal, a series tube with abnormally high filament resistance will rob its companion tube of its normal filament voltage. The robbed tube apparently fails; but when tested under specified conditions, the tube will test GOOD.

13. The versatility of the Hickok Dynamic Mutual Conductance Tube Tester makes possible a special test that will reveal a tube's ability to perform under adverse conditions as mentioned above. This is possible because the tester measures mutual conductance instead of emission.

THE TEST

- a. Measure the mutual conductance in the ordinary way.
- b. Press P4 and adjust the SHUNT dial until the tube reads in the GREEN (GOOD) sector at 2000 on the 0-3000 scale.
- c. While holding everything else constant, reduce the FILAMENT voltage and note the new reading.
- d. If the meter still reads in the GREEN (GOOD) sector, the tube has a large life reserve and will perform satisfactorily.
- e. The filament voltage reductions to be made are shown in the following table:

NORMAL FIL. VOLTS	REDUCE TO
1.5	1.1
2.0	1.5
2.5	2.0
3.0	2.5
5.0	4.3
6.3	5.0
7.5	6.3
10.0	7.5
12.6	10.0
35.0	25.0
50.0	35.0

14. **CONTINUITY TEST** - The Model 800A Tube Tester can be used to test for continuity through resistances up to more than 10 megs.

- a. Set SHORTS switch on position 4.
- b. Connect two leads having prods and pin tips to the jacks marked PLATE and GRID.
- c. Touch the prods to the terminals through which continuity is to be determined.
- d. The meter will indicate continuity.

15. **FILAMENT AND HEATER CONTINUITY**

1. Turn tester on.
2. Set selectors as per chart for tube to be tested.
3. Set LEAKAGE switch on position 5.
4. Set FILAMENT switch on BLST instead of voltage indicated on chart.
5. Place tube in proper socket.

If the meter reads, the filament is good and a complete test should then be made on the tube, by setting FILAMENT switch on the proper tap, and while the tube heats, rotate the LEAKAGE switch several times thru all positions. If leakage is satisfactory, set the switch in TUBE TEST position and proceed to test the tube as per chart.

If the meter does not read, filament is open and further test is unnecessary. Certain tubes such as the 35Z5-50Z7, etc. with tapped filaments have special continuity test settings, see roll chart:

SERIES STRING HEATER CONTINUITY

On the 800A it is possible to make a fast check of filament continuity on a complete set of tubes from a radio or T.V. set without resetting the selector switches.

For tubes with filament or heaters on 7 & 8, 4 & 5, 3 & 4, 2 & 7, 1 & 8*, 1 & 7, set the SELECTORS on BS 34578; set the FILAMENT switch on BLST; and the LEAKAGE switch on Position 4. Turn tester on and adjust to line test. (These switch positions are marked in red).

Lightly insert each tube in tester socket just far enough for pins to make contact with socket contacts--it is not necessary to push tubes completely into socket. If the filament is not open the meter will move up scale indicating filament continuity.

*For battery type tubes with filament on 1&7 set LEAKAGE switch on position 2.

TO TEST BALLAST TUBES

1. Turn Tester on.
2. Set filament switch to BLST.
3. Set SHORT TEST switch on 5.
4. Set first selector switch (lettered A to K) to letter shown in column marked (first selector) -- Set all numbered selectors on zero.
5. ROTATE second selector switch (lettered P to Z) from P to Z. METER SHOULD INDICATE CONTINUITY IN POSITIONS NOTED.

TUBE TYPE	First Selector	Neon lamp should light in these positions					
1A1-1B1-1C1-1E1-1F1-1G1-1J1-1K1-1L1-1N1-1P1-1Q1-1R1G-1S1G-1T1G-1U1G-1V1-1Y1-1Z1-2	J	R					
2UR224	J			T			X
2LR212	H	R	S		U		
3	J	R					
03G	J			T			
4-5	J	R					
6-133	J			T			
6-6AA	J	R					

TUBE TYPE	First Selector	Neon lamp should light in these positions					
7-8-9	J	R					
10-10AG	J			T			
10AB	J			T			X
K17B-M17C-BM17C	J			T			X
M17HG-M17H	J		S				X
	D	R					
K23B-K23C-KX23B-KX30C	J			T			X
M30H	J		S				X
	D	R					
30A-K30A	J			T			
K30D	J	R		T			X
33A-33AG	J			T			
K34B	J			T			X
36A	J			T			
K36B-BK36B-L36B-BM-L36C-KX36C	J			T			X
KX36A	J	R					
36D-L36D	J	R		T			X
L36DJ	J	R	S	T	U		X
K36H-M36H-M36HG	J		S				X
	D	R					
L40S1-L40S2	J	R		T		V	
42A	J			T			
42A ₁	H				U		
42A2-42B2	H		S		U		
K42B-L42B-M42B-KX42B-LX42B-L42BX-K42C L42C-M42C	J			T			X
KB42D-K42D-L42D	J	R		T			X

TUBE TYPE	First Selector	Neon lamp should light in these positions					
LX42D-L42DX	J	R	S	T			
K42E-L42E	J			T			X
L42F	J						X
	D	R					
42HA-K42HJ-M42H-M42HG	J		S				X
	E	R		T			
KX42C	J			T			X
L42S1	J	R		T		V	
49A-49AJ-K49AJ	J			T			
KX49A	J			T			X
49A1	H				U		
49A2-49B2	H		S		U		
K49B-L49B-M49B-BM49B-K49C-M49C-BM49C-BK49C-K49E-L49E	J			T			X
K49D-BK49D-L49D	J			T			X
L49F	J						X
	D	R					
M49H-M49HG	J		S				X
	D	R					
KZ49B-KZ49C	J	R				V	
K49BJ-L49BJ	J			T	U		X
L49S2	J	R		T		V	
49AJ-K49AJ	J			T			
KX49B-LX49B-LX49C	J			T			X
L49DJ	J	R		T	U		X
L49S3	J	R		T		V	
50A2	J	R		T			
50A2MG-50B2	J	R				V	

TUBE TYPE	First Selector	Neon lamp should light in these positions					
50X3	J	R					
K52H-M52H	J		S				X
	D	R					
K54B	J			T			X
55A-K55A	J			T			
55A1	H				U		
KX55A	J	R					
55B-K55B-M55B-BM55B-L55BG-LX55B	J			T			X
55A2-55B2	H		S		U		
K55C-L55C-KX55C	J			T			X
K55CP	J			T		V	X
K55D-L55D	J	R		T			X
L55E-M55E	J			T			X
L55F-M55F-BL55F	J						X
	D	R					
K55H-M55H-M55HG	J		S				X
	D	R					
L55S1-L55S2	J	R		T		V	X
60R30G	J	R		T			
64. 23	J			T			
67A	J			T			
K67B-L67B	J			T			X
L73B-K74B-L74B-CX74C	J			T			X
80A	J			T			
K79B-K80B-M80B-K80C-KX80B-L80B	J			T			X
K80F	J						X
	D	R					

TUBE TYPE	First Selector	Neon lamp should light in these positions					
KX87B-LX87B-L90B	J			T			X
K90F-M90F-K92F-M92F	J						X
	D	R					
92A	J			T			
L92B-95K2	J			T			X
L99D	J	R		T			X
100R8	J			T			X
120R	J	R					
120RS-135K1	J			T			X
135K1A	J			T	U		X
140L4-140L8-140R4-140R8	J	R		T			
140R	J	R					
140L44-140R44	J	R	S	T			
165L4-165R4-165R8	J	R		T			
165R	J	R					
165L44-165R44	J	R	S	T			
185L4-185L8-185R4-185R8	J	R		T			
185R	J	R					
185L44-185R44	J	R	S	T			
200R-250R	J	R					
250R8-290L4	J			T			X
300R4-320R4	J			T			X
340	J	R					
808-1	J			T	U		X
E14980-W43357-W4588-3613	J			T			X

TUBE TYPE	First Selector	Neon lamp should light in these positions					
3334-3334A	J	R		T			X
8593-8598-8601-8664	J			T			X
3ER248	J	R		T	U		X
3CR241	J	R		T			X

CHECKING TRANSISTORS AND DIODES ON THE MODEL 800 A

Transistors - PNP - NPN

Testing Junction and Point Contact transistors:

Rotate LEAKAGE SWITCH (lower right corner of panel) clockwise from TUBE TEST to TRANSISTOR TEST.

1. Insert the transistor to be checked in the proper socket, PNP or NPN. Consult manufacturer's data to determine the type. Transistors can be damaged if inserted in wrong socket.
2. SHUNT dial is adjusted until meter reads full scale (or to the maximum reading possible if transistor will not cause meter to read full scale). If meter fails to read, transistor is open or defective.
3. Push slide switch from GAIN to LEAKAGE position. Meter will now read leakage current. If reading is in the POOR area, the transistor should be discarded.

Rectifiers - Copper Oxide, Selenium, and Silicon

The red (+) and black (-) jacks, located near the transistor test sockets are used to check the forward to reverse conduction ratio of rectifiers. Rectifiers must be disconnected from its circuit when testing.

1. The positive terminal of the rectifier is connected to the black (-) jack. The negative terminal of the rectifier is connected to the red (+) jack. When connected this way the rectifier is biased in the forward direction.
2. Rotate leakage switch (lower right corner) clockwise from TUBE TEST to TRANSISTOR TEST.
3. Adjust shunt dial for full scale deflection of meter (100%).
4. Connections to rectifier are then reversed, rectifier is then biased in reverse direction. Rectifiers that read 10% or more in reversed direction are probably defective and should be replaced.

Diodes - Silicon and Germanium

1. Diodes are checked by the same procedure as testing rectifiers, because they rectify but do not handle large currents like power rectifiers.

Some knowledge of the characteristics of the diode being tested will help because some high conduction diodes used in video detectors, can be rated good if they produce a 10:1 (10%) forward to reverse conduction ratio.

PARTS LIST FOR MODEL 800A TUBE TESTER

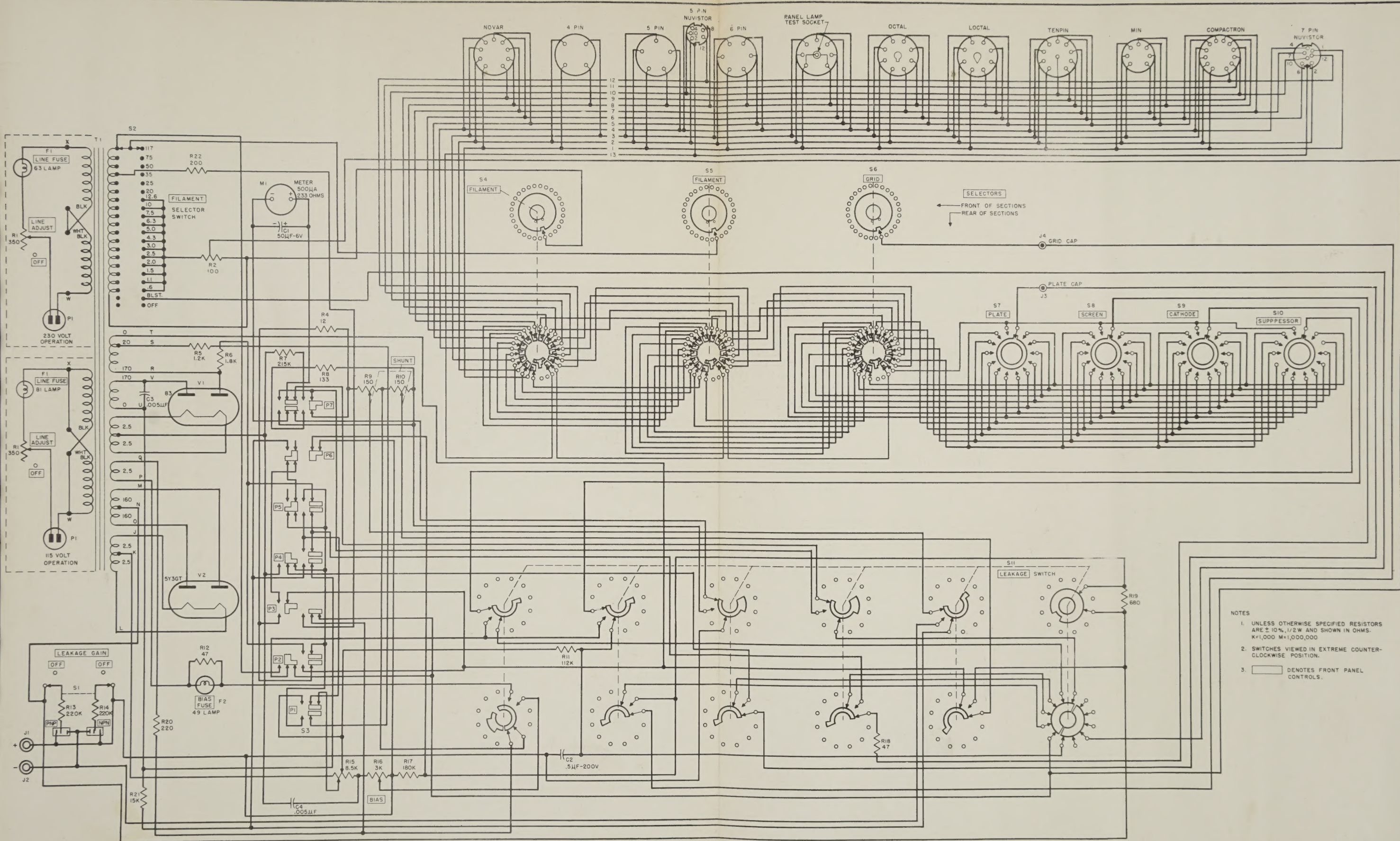
Reference designations are assigned to identify all parts of the Model 800A. These designations are used in the Parts List and Schematic Wiring Diagram. The letter prefix of a reference designation indicates the kind of part -- resistor, capacitor, electron tube, etc. The number differentiates between parts in the same group.

REF. DESIG.	NOTES	NAME AND DESCRIPTION	HICKOK PART NO.
A1		DIAL ASSEMBLY: Bias Control	4160-67
A2		DIAL ASSEMBLY: Shunt Control	4160-73
C1		CAPACITOR, ELECTROLYTIC: 50 μ f, 6 volts	3085-45
C2		CAPACITOR, PLASTIC, TUBULAR: .5 μ f, 200 volts	3105-206
C3		CAPACITOR, CERAMIC: .005 μ f	3110-7
C4		Same as C3	
F1		LAMP: #81, bayonet type, for 115 volt operation	12270-2
F1		LAMP: #63, bayonet type, for 230 volt operation	12270-58
F2		LAMP: #49 pilot, .06 amp, 2 volts	12270-17
J1		JACK: pin plug type, red	10300-1
J2		JACK: pin plug type, black	10300-2
J3		Same as J1 PLATE CAP	
J4		Same as J2 GRID CAP	
M1		METER: D. C. , 66K, 500 microamps, 233 ohms	660-114
MP1		KNOB: machined, with white dot, bar type	11505-46
MP2		Same as MP1	
MP3		Same as MP1	
MP4		Same as MP1	
MP5		Same as MP1	
MP6		Same as MP1	
MP7		Same as MP1	
MP8		Same as MP1	
MP9		Same as MP1	
MP10		Same as MP1	
P1		CORD: AC line	3675-7
R1		RHEOSTAT: 350 ohms, 25 watts, with concentric off position (Line Adjust)	18750-37
R2	✓	RESISTOR: 100 ohms, 10%, 10 watt, center tapped	18575-19
R3		Not Assigned	
R4		RESISTOR, FIXED, DEPOSITED FILM: 12 ohms, 1%, 1/2 watt	18537-59
R5		RESISTOR, FIXED, COMPOSITION: 1.2K ohms, 10%, 1 watt	18422-122

REF. DESIG.	NOTES	NAME AND DESCRIPTION	HICKOK PART NO.
R6		RESISTOR, FIXED: 1800 ohms, 10%, 10 watt	18575-12
R7		RESISTOR, FIXED, DEPOSITED FILM: 215K ohms, 1%, 1 watt	18539-32
R8		RESISTOR, FIXED, DEPOSITED FILM: 133 ohms, 1%, 1/2 watt	18537-91
R9		POTENTIOMETER, WIRE WOUND: 150-150 ohms (Shunt Control)	16925-90
R10		Same as R9 (Shunt Control)	
R11		RESISTOR, FIXED, DEPOSITED FILM: 112K ohms, 1%, 1/2 watt	18537-55
R12		RESISTOR, FIXED, COMPOSITION: 47 ohms, 10%, 1/2 watt	18410-472
R13		RESISTOR, FIXED, COMPOSITION: 220K ohms, 10%, 1/2 watt	18414-222
R14		Same as R13	
R15	✓	RESISTOR, WIRE WOUND: 8500 ohms, 10 watt	18575-89
R16		POTENTIOMETER, ADJUSTED: (3K) (Bias Control)	16926-5
R17		RESISTOR, FIXED, COMPOSITION: 180K ohms, 10%, 1/2 watt	18414-182
R18		Same as R12	
R19		RESISTOR, FIXED, COMPOSITION: 680 ohms, 10%, 1/2 watt	18411-682
R20		RESISTOR, FIXED, COMPOSITION: 220 ohms, 10% 1/2 watt	18411-222
R21		RESISTOR, FIXED, COMPOSITION: 15K ohms, 5%, 1 watt	18423-151
R22		RESISTOR, FIXED, DEPOSITED FILM: 200 ohms, 1%, 2 watt	18540-5
S1		SWITCH: Slide D. P. D. T. spring return (Gain - Leakage)	19911-64
S2		SWITCH: Rotary, 1 section, 2 pole, 20 positions (Filament Selector Switch)	19912-202
S3		SWITCH: Push Button, 7 button gang	19910-95
S4		SWITCH: Rotary, 1 section, 14 position (Filament Selector)	19912-477
S5		Same as S4 (Filament Selector)	
S6		Same as S4 (Grid Selector)	
S7		SWITCH: Rotary, 1 section, 14 position (Plate Selector)	19912-469
S8		Same as S7 (Screen Selector)	
S9		Same as S7 (Cathode Selector)	
S10		Same as S7 (Suppressor Selector)	
S11		SWITCH: Rotary, 6 section, 7 position, (Leakage Test)	19912-376

REF. DESIG.	NOTES	NAME AND DESCRIPTION	HICKOK PART NO.
T1		TRANSFORMER: Power	20800-305
V1		TUBE: 83	20875-28
V2		TUBE: 5Y3GT/G	20875-6
XF1		SOCKET: bayonet	19350-1
XF2		SOCKET: miniature, bayonet base	19350-203
XQ1		SOCKET: Transistor	19350-280
XV1		SOCKET: wafer, 4 pin	19350-157
XV2		SOCKET: wafer, octal	19350-156
XV3		SOCKET: 9 pin, Novar	19350-367
XV4		SOCKET: 4 pin, black	19350-93
XV5		SOCKET: 5 pin	19350-94
XV6		SOCKET ASSEMBLY: 5 pin Nuvistor	19350-381
XV7		SOCKET: 6 pin	19350-95
XV8		SOCKET: 7 pin	19350-96
XV9		SOCKET: 8 pin, octal	19350-99
XV10		SOCKET: Loctal, 8 pin	19350-97
XV11		SOCKET: 9/10 pin miniature	19350-364
XV12		SOCKET: 7 pin miniature	19350-136
XV13		SOCKET: 12 pin, Compactron	19350-365
XV14		SOCKET: 7 pin Nuvistor Assembly	19350-382
		BOOKLET: Instructions	2490-477
		CHART: Data Roll	3200-98

NOTE: A minimum billing charge of \$3.50 will be assessed for any parts order.
Prices are subject to change without notice.



NOTES

1. UNLESS OTHERWISE SPECIFIED RESISTORS ARE $\pm 10\%$, $1/2$ W AND SHOWN IN OHMS. K=1,000 M=1,000,000
2. SWITCHES VIEWED IN EXTREME COUNTER-CLOCKWISE POSITION.
3. DENOTES FRONT PANEL CONTROLS.

